

Architecture for urban agriculture. Spaces and architectures for commercial indoor "zero-acreage farms"

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Doctoral Dissertation

Doctoral Program in DASP- Architecture, History and Project (31st Cycle)

DAD-Department of Architecture and Design

Architecture for urban agriculture (or Urban agricultural architecture)

Spaces and architectures for commercial indoor
“zero-acreage farms”

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Abstract

From the early 2000s, the focus on global issues, such as global growth, climate change, and food security, have shaken the various scientific disciplines. Among the most pressing problems is the need to provide for agricultural production systems that can respond to the urban population growth. Architecture has also tried to make its own contribution to the global debate with the creation of the concept of a new type of urban farms: The Z-farm. A Zero Acreage farm make it possible to cultivate inside or atop the buildings, in a different way from the on-soil technique. These utopian projects had to face technical, economic and environmental feasibility challenges. However, architects and designers have been experimenting new solutions for years to transform it into a viable production.

This integration of agriculture in architecture turns out to be entirely new, and very few researches have been conducted on the architectural features of commercial indoor farms (Caputo, 2012). This is because, before technological innovation such as LED and no-soil growing techniques, scholars had investigated the link between architecture and agriculture as a historical relationship between production and place of consumption, farmland and built environment, or agricultural activities and structures supporting them, mostly with a planning and architectural landscape approach.

In contrast with these, this thesis attempts to analysing, by first, the evolution of the agricultural spaces that have become urban, built and indoor, to then define its new forms through a survey of case studies, and finally to figure out a “toolkit” built by using best practices derived from the cases that have been investigated in the research.

The structure of the thesis is composed of three parts. The first part gives an overview on the evolution of urban agriculture spaces, how these practices have been linked to different needs over the centuries, and which roles they had in the urban environment (eg. “Victory Gardens”). This part defines also the research framework and provides the base and the assumption for developing the topic of the research. The integration “city-agriculture” has been investigated starting from the evocation of some topical projects more relate to urban design and planning, such as “Broadacre City” (1934–35) by F.L.Wright and “New Regional Pattern” (1945–49) by L.Hilberseimer. Then, the studies conducted on the continuous productive urban landscape (2012) by A.Viljoen et al. and the first example and studies on the buildings integrated agriculture investigated by M. Gorgolewski, J. Komisar, J. Nasr in the publication “*Carrot City*” (2011) have consolidated this research background, approaching to the pivotal point: the architecture for urban agriculture.

Hence, the second section contains the definition of the research topic: the indoor commercial Z-farms and its in-depth analysis (typologies, characteristics, and

elements of weakness) through the case studies. The method used is the case studies analysis. Since the lack of official sources and solid scientific literature, this method has been chosen as a tool to analyze the architecture and the relationships that Z-farms establish with the city. This part answers the research questions on the identification of the spaces for urban Z-farming and it defines the issues encountered by this new production. the methodology followed this path: the first step has been the definition of what is meant by case study, then the subsequent identification of cases and, finally, the analysis of the components of the object from the architectural-formal and relational-urban point of view. The book “Case study research and application”(2017) by Robert K. Yin has been used as guidelines for the analysis. I collected data from field surveys where it was possible. I have also gathered information from protagonists of the sector, by conducting semi-structured interviews with stakeholders, such as urban farmers, consultants, agronomist, professors, architects, developers, experts in the cities of Montréal, Toronto, New York, Boston, Chicago, Detroit.

The previous analysis has been preparatory and useful in understanding the strengths and weaknesses of the urban indoor Z-farms. This has allowed identifying the elements considered more virtuous and, therefore, more reproducible to create a “practical design toolkit” that could be helpful for architects, urban planners, and municipalities, that represent the third and conclusive part of the research.